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(54) **KIOSK BASED VEHICLE DIAGNOSTIC SYSTEM**

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None
See application file for complete search history.

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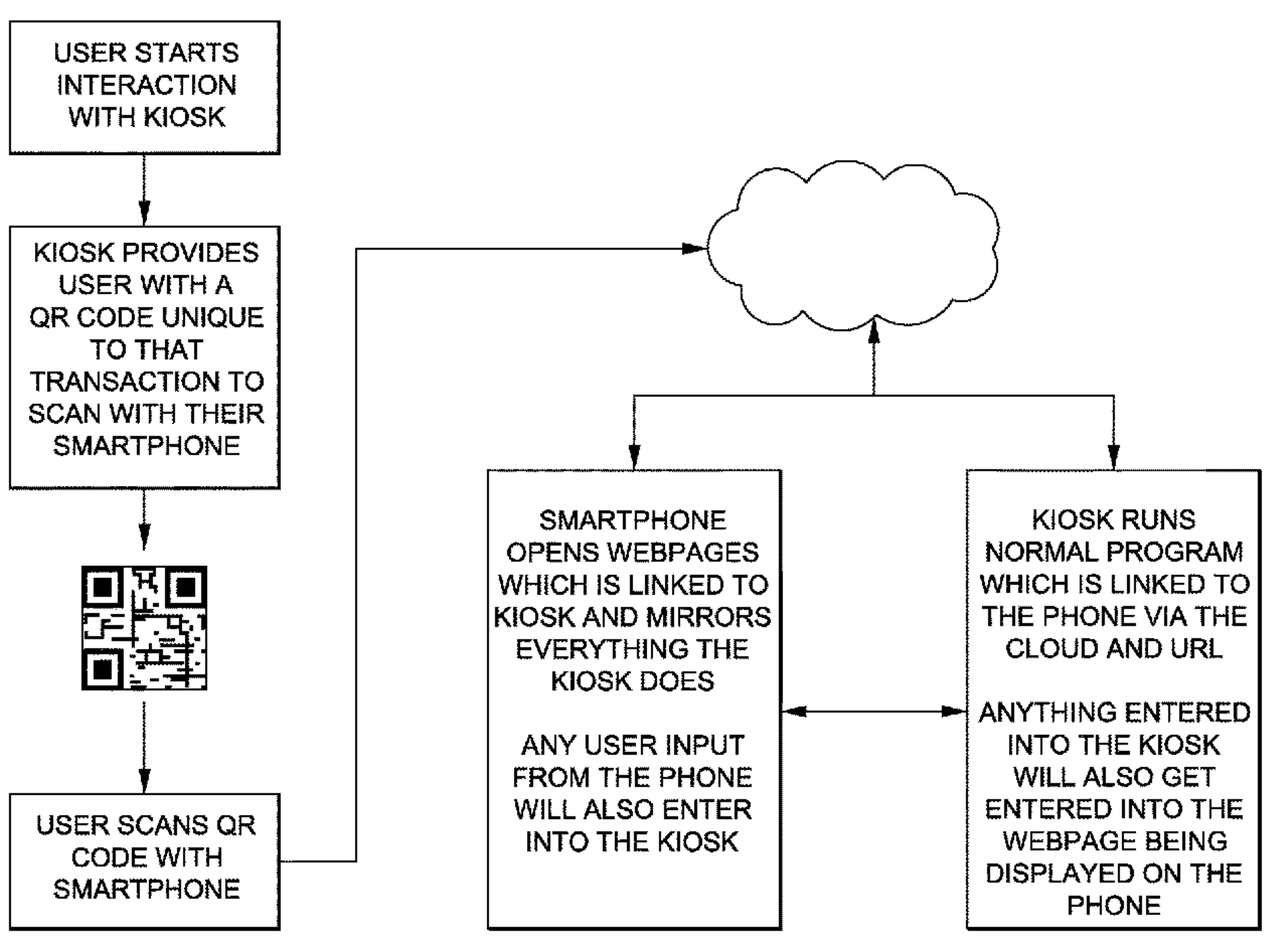
(57) **ABSTRACT**

A vehicle diagnostic includes a kiosk a display configured to depict a visual code thereon, with the visual code being readable by a handheld communication device and associated a unique electronic identifier. The kiosk additionally includes a diagnostic tool connectable to a vehicle to retrieve vehicle data therefrom. A remote server is in communication with the kiosk and is disposable in communication with the handheld communication device. The server is capable of: receiving a signal from the handheld communication device including the unique electronic identifier; receiving a signal from the kiosk including the vehicle data; analyzing the vehicle data to determine a diagnostic solution; and storing the diagnostic solution such that the diagnostic solution is retrievable in response to receipt of a subsequent signal including the unique electronic identifier.

27 Claims, 4 Drawing Sheets



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G06K 7/14	(2006.01)
G06K 7/10	(2006.01)
H04N 7/18	(2006.01)
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G06Q 10/00	(2012.01)

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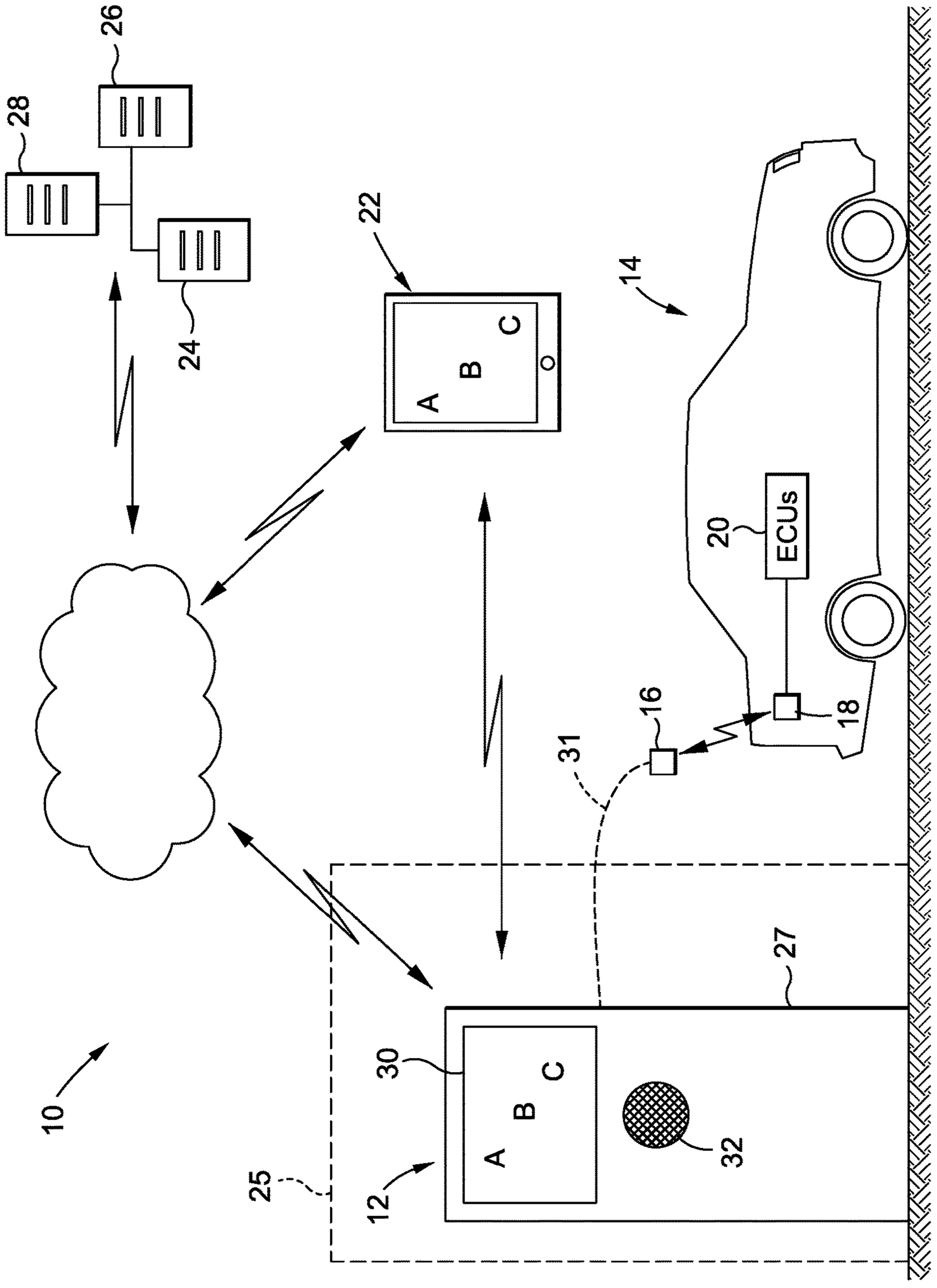

FIG. 1

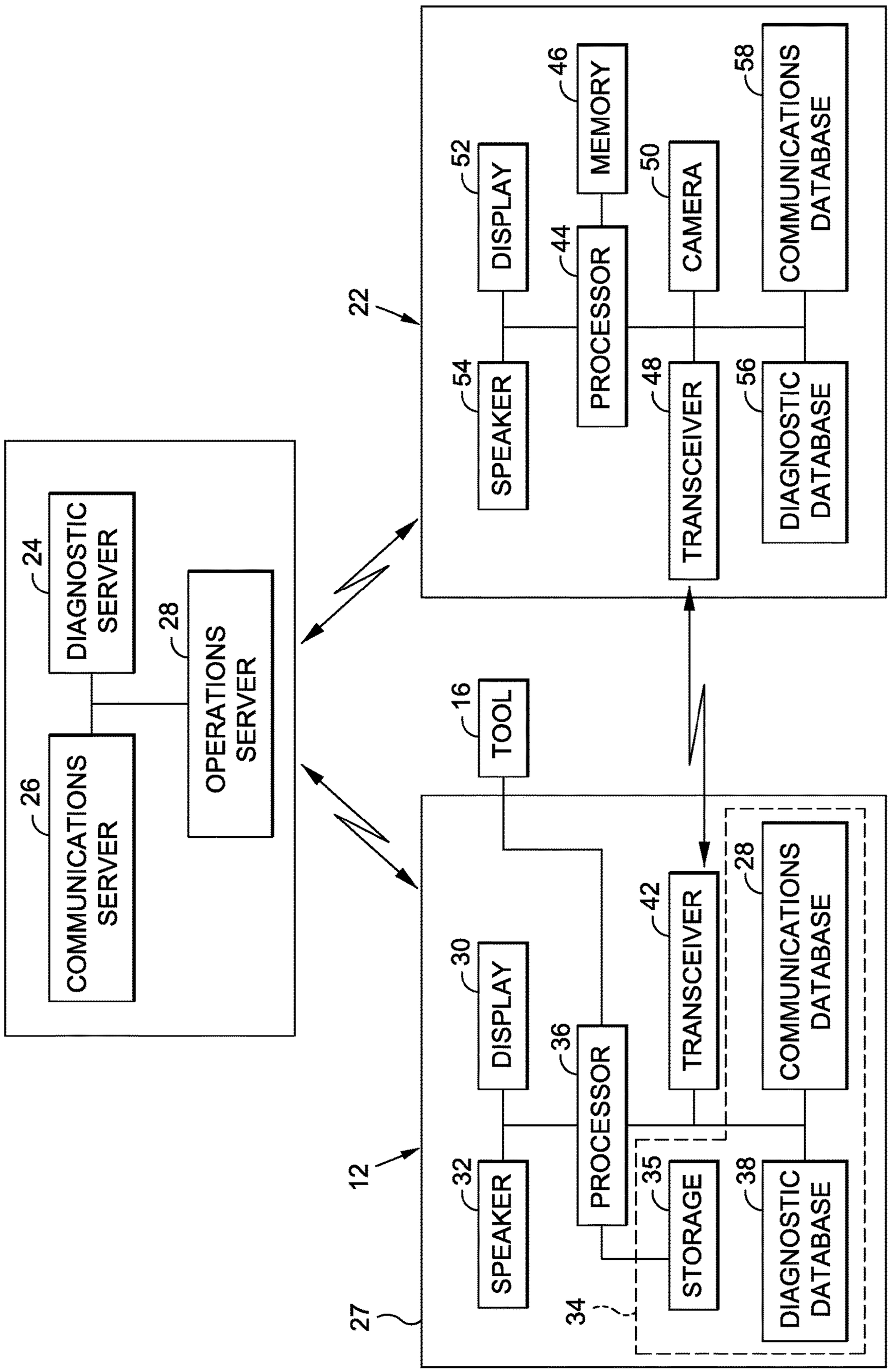
22
DISPLAY
52
MEMORY
46
PROCESSOR
44
CAMERA
50
COMMUNICATIONS DATABASE
58
SPEAKER
54
TRANSCEIVER
48
DIAGNOSTIC DATABASE
56
DIAGNOSTIC SERVER
24
OPERATIONS SERVER
28
COMMUNICATIONS SERVER
26
TOOL
16
12
27
DISPLAY
30
PROCESSOR
36
TRANSCEIVER
42
COMMUNICATIONS DATABASE
28
SPEAKER
32
STORAGE
35
DIAGNOSTIC DATABASE
38
34

FIG. 2

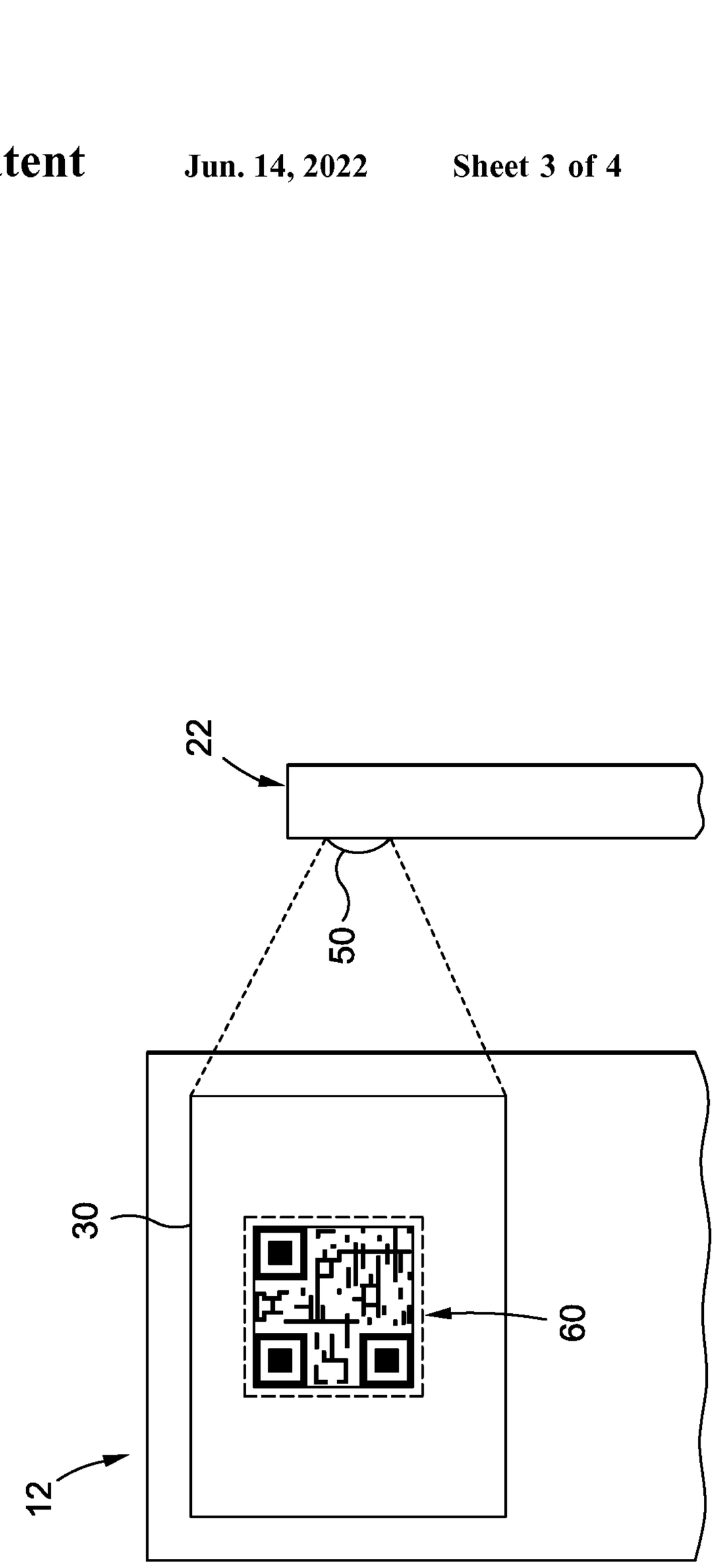

FIG. 3

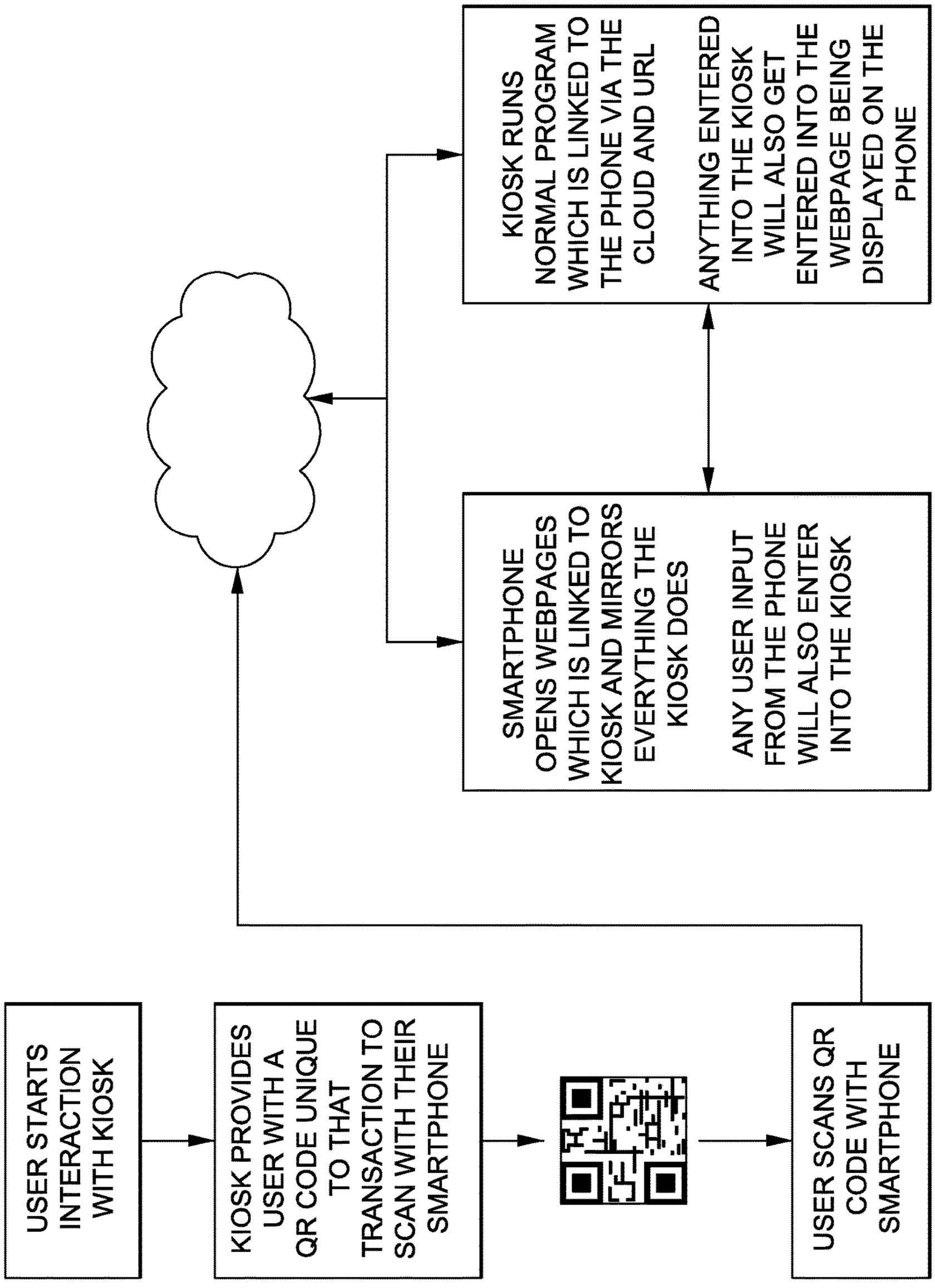
USER STARTS INTERACTION WITH KIOSK
KIOSK PROVIDES USER WITH A QR CODE UNIQUE TO THAT TRANSACTION TO SCAN WITH THEIR SMARTPHONE
USER SCANS QR CODE WITH SMARTPHONE
SMARTPHONE OPENS WEBPAGES WHICH IS LINKED TO KIOSK AND MIRRORS EVERYTHING THE KIOSK DOES
ANY USER INPUT FROM THE PHONE WILL ALSO ENTER INTO THE KIOSK
KIOSK RUNS NORMAL PROGRAM WHICH IS LINKED TO THE PHONE VIA THE CLOUD AND URL
ANYTHING ENTERED INTO THE KIOSK WILL ALSO GET ENTERED INTO THE WEBPAGE BEING DISPLAYED ON THE PHONE

FIG. 4

KIOSK BASED VEHICLE DIAGNOSTIC SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT RE: FEDERALLY SPONSORED RESEARCH/DEVELOPMENT

Not Applicable

BACKGROUND

1. Technical Field

The present disclosure generally relates to a vehicle diagnostic system, and more specifically, to a kiosk-based or computer tablet-based vehicle diagnostic system capable of utilizing the capabilities of a user's handheld communication device as a user interface.

2. Description of the Related Art

Modern vehicles include a network of electronic systems and control modules, which may be associated with several different aspects of the vehicle, such as the powertrain, braking, steering, suspension, climate control, lighting, entertainment, communications, or navigation. A network scan may refer to the process of communicating with the various control units or modules on a particular vehicle to identify any faults that may be present or to identify the status of the various modules. Network scans may also be an integral component of safety inspections, particularly in relation to advanced driver-assistance systems (ADAS). A network scan may be completed by a scan tool designed to interface with the vehicle via a diagnostic port on the vehicle.

Scan tools may be a significant resource for mechanics or vehicle enthusiasts who enjoy maintaining their own vehicle, as the scan tool may allow the mechanic or vehicle owner to access the vehicle data and analyze the data to identify a possible diagnosis as to what may be wrong with the vehicle. Once a diagnosis has been identified, the vehicle professional or auto enthusiast may obtain any necessary repair parts and perform any related repair services associated with a likely fix.

While a scan tool may provide access to useful diagnostic information for a vehicle professional or vehicle enthusiast, many vehicle owners may not own a scan tool, and thus, may not be able to easily diagnose a vehicle. Furthermore, many vehicle owners may be intimidated by vehicle diagnostic equipment due to possible personal inexperience in vehicle maintenance and repair. Consequently, the idea of using a scan tool may be overwhelming to many vehicle owners, and thus many vehicle owners may forego regular review of diagnostic data on a vehicle. When left unattended, minor diagnostic issues may evolve into major diagnostic issues associate with greater cost. Thus, in most cases, it is in the best interest of the vehicle owner to regularly retrieve and review diagnostic data from the vehicle.

Vehicle parts stores and repair shops may also have an interest in their customers having a more regular retrieval and review of diagnostic data. It is likely that vehicle owners would become more frequent customers of vehicle parts stores and repair shops to address minor diagnostic issues identified during a review of diagnostic data.

Moreover, vehicle parts stores and repair shops may also have an interest in being involved in the customer's retrieval of diagnostic data and the diagnostic analysis of such data. In this regard, vehicle parts stores and repair shops may be able to more seamlessly generate sales associated with the customer's vehicle diagnosis if they are involved in the diagnostic process. However, there may be logistical complications associated with such involvement. For instance, there may be logistical difficulties in obtaining a comprehensive set of information, which may not only include the diagnostic data, but also customer information and vehicle information, which may be required for the vehicle diagnosis, and also for any referrals that may be made based on the diagnosis. Furthermore, even if such information can be obtained, there may be difficulties in organizing the information by customer or by specific transactions, without disrupting or interfering with an already existing computer system in the store or repair shop.

Accordingly, there is a need in the art for a vehicle diagnostic system which may be easily accessible to a vehicle owner and which may utilize hardware that may be familiar to a vehicle owner. There is also a need in the art for such a system which may serve customers of vehicle parts and repair shops and which can easily retrieve data from a vehicle and customer to complete a vehicle diagnosis. Various aspects of the present invention are directed toward addressing these needs, as will be discussed in more detail below.

BRIEF SUMMARY

Various aspects of the present invention are directed toward a kiosk-based vehicle diagnostic system, which may rely on, or be supported by, the capabilities of a handheld communication device, e.g., smartphone, for data input and/or display. The kiosk may include a tool which may be connectable with a port on the vehicle to retrieve data therefrom. The kiosk may display a visual code which may be readable by the smartphone to pair the smartphone with the kiosk to allow vehicle identification information to be entered into the smartphone and uploaded to the kiosk to allow for configuration of the tool for communication with the vehicle. The kiosk may be located at an automotive parts store, an automotive service location, along streets or highways, at shopping centers, in parking lots, or other easily accessible locations for drivers.

According to one embodiment, there is provided a vehicle diagnostic system for use with a handheld communication device. The vehicle diagnostic system includes a kiosk having a housing and a processor disposed within the housing and capable of generating or receiving a signal associated with a visual code. The kiosk additionally includes a display associated with the housing and in communication with the processor to receive the signal. The display is configured to depict the visual code thereon in response to receipt of the signal, with the visual code being readable by the handheld communication device and associated a unique electronic identifier. The kiosk additionally includes a diagnostic tool connected to the housing and connectable to a vehicle to retrieve vehicle data therefrom. The vehicle diagnostic system further comprises a remote server in communication with the kiosk and disposable in communication with the handheld communication device. The remote server may be in communication with the kiosk and the handheld communication device via the Internet,

cellular communication networks, or the like. The server is capable of: receiving a signal from the handheld communication device including the unique electronic identifier; receiving a signal from the kiosk including the vehicle data; analyzing the vehicle data to determine a diagnostic solution; and storing the diagnostic solution such that the diagnostic solution is retrievable in response to receipt of a subsequent signal including the unique electronic identifier.

The server may be configured to communicate the diagnostic solution to the handheld communication device for presentation on the handheld communication device. The server may be configured to communicate the diagnostic solution to the kiosk via the Internet, or other communication pathways, for presentation on the display.

The kiosk may include a transceiver in communication with the processor and capable of communicating with the handheld communication device via wired or wireless communication. The kiosk may include a local communications database including a plurality of vehicle protocols correlated with vehicle identification information.

The visual code may be a QR (Quick Response) code, a barcode, an alphanumeric code, universal product code (UPC), tiny url, or other unique visual code.

The vehicle data may include diagnostic trouble codes, and the diagnostic solution may include a most likely fix based on at least one of the diagnostic trouble codes.

According to one embodiment, there is provided a vehicle diagnostic system for use with a handheld communication device. The vehicle diagnostic system includes a kiosk having a housing and a transceiver disposed within the housing and configured to communicate with the handheld communication device. The kiosk additionally includes a processor disposed within the housing and capable of generating a signal including an associated visual code. The kiosk further includes a display associated with the housing and in communication with the processor to receive the signal, with the display being configured to depict the visual code thereon in response to receipt of the signal. The visual code is readable by the handheld communication device and is associated with instructions for configuring the handheld communication device to communicate with the transceiver. The kiosk additionally includes a diagnostic tool in communication with the housing and communicable with a vehicle to retrieve data therefrom. The vehicle diagnostic system further includes computer executable instructions downloadable onto the handheld communication device for configuring the handheld communication device to read the visual code depicted on the display, and establish communication between the handheld communication device and the kiosk to facilitate data transfer between the handheld communication device to kiosk.

The computer executable instructions may further configure the handheld communication device to identify a kiosk communication characteristic associated with the visual code in response to receipt of the visual code. The kiosk communication characteristic may include a communication protocol or may include a communication address.

The computer executable instructions may further configure the handheld communication device to display a prompt to a user to enter vehicle identification information into the handheld communication device.

The computer executable instructions may additionally configure the handheld communication device to utilize an onboard camera to optically obtain vehicle identification information from a vehicle.

The computer executable instructions may further configure the handheld communication device to display diagnostic information associated with the data retrieved by the diagnostic tool. The diagnostic information may include diagnostic trouble codes, or a diagnostic solution associated with the retrieved data.

The computer executable instructions may further configure the handheld communication device to depict content depicted on the display of the kiosk.

The display on the kiosk may be configured to display information associated with the data retrieved by the diagnostic tool.

The visual code may include a QR code or a barcode.

According to another embodiment, there is provided a vehicle diagnostic method comprising the steps of generating a visual code on a kiosk display for scanning by a camera on a handheld communication device. The method additionally includes receiving, at the kiosk, vehicle data retrieved from a vehicle under test. A signal is communicated to a remote server via the Internet or other communication pathways, with the signal including the vehicle data and an identifier associated with the visual code. The vehicle data is analyzed to determine a possible vehicle fix associated with the vehicle data. The method further includes storing the possible vehicle fix on the remote server in a manner which allows for subsequent retrieval of the possible vehicle fix from the remote server in response to receiving the identifier at the remote server.

The method may additionally include the step of transmitting the possible vehicle fix from the remote server to the handheld communication device.

The method may further comprise communicating vehicle data from the handheld communication device to the kiosk, and deriving at least one vehicle communication protocol from the vehicle data.

The method may additionally include the steps of scanning the visual code onto a handheld communication device, acquiring vehicle diagnostic data from the vehicle under test via the handheld communication device, and communicating the vehicle data from the handheld communication device to the kiosk and/or to the remote server.

The generating step may include generating a non-human readable visual code on the kiosk display. The generating step may include generating a QR code on the kiosk display.

The method may also include encrypting the signal prior to sending the signal to the remote server.

The presently contemplated embodiments will be best understood by reference to the following detailed description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the various embodiments disclosed herein will be better understood with respect to the following description and drawings, in which:

FIG. **1** is a schematic system overview of a kiosk based vehicle diagnostic system;

FIG. **2** is a schematic diagram of a kiosk, a handheld communication device and a remote server;

FIG. **3** is a schematic view of a handheld communication device scanning a QR code depicted on a kiosk; and

FIG. **4** is a flow chart of an exemplary use of the kiosk based vehicle diagnostic system.

Common reference numerals are used throughout the drawings and the detailed description to indicate the same elements.

DETAILED DESCRIPTION

Referring now to the drawings, wherein the drawings are for purposes of illustrating a preferred embodiment of the

present invention only, and are not for purposes of limiting the same, there is depicted a vehicle diagnostic system **10** which utilizes a kiosk **12** which may be deployed in a convenient location for retrieving data and information from a vehicle **14** and interfacing with a customer. In this regard, it is contemplated that the kiosk **12** may be deployable at a vehicle parts store, a convenience store, a gas station, a parking lot, or other easily accessible location. The kiosk **12** may include a tool **16** plug connectable into a diagnostic port **18** on the vehicle **14** to communicate with the electrical system on the vehicle **14**, i.e., the vehicle ECU **20** for retrieving vehicle data and/or vehicle information. Once the vehicle data and information is obtained, it may be analyzed to produce a diagnostic summary. The customer may be required to interact with the kiosk **12** at various stages of the process to provide information, as well as to receive the diagnostic summer. Accordingly, various aspects of the present disclosure are directed toward utilizing a customer's handheld communication device **22** to facilitate and enhance customer interaction with the kiosk **12**. In one embodiment, the customer's handheld communication device **22**, e.g., smartphone, may be operatively linked to the kiosk **12** to allow the handheld communication device **22** to serve as a user interface for the kiosk **12**. For instance, the smartphone **22** may be used to retrieve vehicle identification information from the vehicle **14** and upload such information to the kiosk **12** or to a remote server **24**, **26**, **28** operatively associated with the kiosk **12**. In this regard, it is contemplated that the smartphone **22** may be used as a "hotspot" (e.g., a location which may provide Internet access) for the kiosk **12**. The smartphone **22** may also be used to display diagnostic results subsequent to any retrieval of data from the vehicle **14**.

The smartphone **22** may be operatively linked to the kiosk **12** by displaying a unique visual code on the kiosk **12**. The visual code may be scanned by the smartphone **22**, which may cause the smartphone **22** to send a signal to a remote operations server **28** for creating a record on the remote operations server **28** of the customer's interaction with the kiosk **12**. The stored record may be associated with a unique code, which may allow retrieval of any diagnostic data and any results associated with the customer's interaction with the kiosk **12** at any time when the unique code is provided to the server **28**. Furthermore, the scanning of the visual code by the smartphone **22** may configure the smartphone **22** to communicate directly with the kiosk **12**. As such, any data or information retrieved by the smartphone **22** or entered into the smartphone **22** may be uploaded, or relayed to the kiosk **12** via the Internet, cellular communication network, or communication pathways, and any information displayed on the kiosk **12** may be mirrored on the smartphone **22**. Therefore, by interfacing the smartphone **22** with the kiosk **12**, data and information may be more easily collected, analyzed and presented to the customer. Furthermore, for customers that may be overwhelmed or intimated by vehicle diagnostics, the ability to use the customer's own smartphone **22** may ease any concerns and allow for a more user-friendly experience.

FIG. **1** is a system level view showing the kiosk **12**, the smartphone **22**, and a vehicle **14**. Both the kiosk **12** and the smartphone **22** are capable of communicating with one or more remote servers, such as a diagnostic server **24**, a communications server **26**, or operations server **28**. The smartphone **22** may have an application ("app") downloaded thereon and which may be used to facilitate communication between the smartphone **22** and the kiosk **12** and/or between the smartphone **22** and the remote servers **24**, **26**, **28** via the Internet, or cellular communication network, or the like.

The kiosk **12** may include a housing **27** which may be mounted on the ground or an underlying support surface. The kiosk **12** may be positioned inside a store **25** or in a location closer to the vehicle, such as outside in a parking lot. Accordingly, particularly when positioned outside, the housing **27** may be configured to be withstand the natural elements, such as rain, sleet, snow, sunlight, wind, freezing temperatures, etc. The housing **27** may be formed from metal, plastic, wood, or other materials known in the art.

A display **30** may be connected to the housing **27** for displaying information related to operation of the kiosk **12** and a speaker **32** may also be connected to the housing **27** for playing audible signals associated with operation of the kiosk **12**. The display **30** may be a touch-screen display or a non-touch screen display.

The kiosk **12** may additionally include a memory **34** and a processor **36** located within the housing **27**. The memory **34** may include storage **35** capable of storing operational information, such as operating instructions. The storage **35** may also be capable of short-term data storage, such as buffering data during an interaction with a particular vehicle **14** or customer (e.g., buffering vehicle data, vehicle identification information, handheld device identification information, customer information, etc.).

The memory **34** may additionally include a diagnostic database **38** to allow the kiosk **12** to perform a certain degree of diagnostic analysis locally at the kiosk **12**. For instance, the diagnostic database **38** may allow for translation of diagnostic trouble codes (DTC's). More comprehensive diagnostic analysis may be performed using the local database **38**, although it is contemplated that the kiosk **12** may rely on a remote diagnostic server **24** for more comprehensive diagnostic analysis, as will be described in more detail below.

The memory **34** may further include a communications database **40**, which may be used by the kiosk **12** to facilitate communications to and from the kiosk **12**. For instance, the communications database may be used to facilitate communications between the kiosk **12** and a vehicle **14**. In this regard, the communications database **40** may include various vehicle communication protocols associated with vehicle identification information. The vehicle communication protocols stored on the communications database **40** may include basic communications protocols, such as SAE J1850 PWM, SAE J1850 VPW, ISO9141-2, ISO14230-4 (KWP2000), and ISO 15765-4/SAE J2480. Additional communication protocols needed to communicate with a specific vehicle system may also be stored on the communications database **40** or may be accessed on a remote communications server **26**. The communications database **40** may also include communication protocols or instructions for communicating with one or more handheld devices **22**, as well as communicating with remote locations, such as remote servers or databases. In this regard, the communications database **40** may include preprogrammed website addresses that may be visited to access remote resources, such as diagnostic databases or diagnostic analysis tools.

The processor **36** may be configured to execute any operational commands associated with operation of the kiosk **12**. In this regard, the processor **36** may be in communication with the various components on the kiosk **12** to facilitate the functioning of the kiosk **12**.

The kiosk **12** may also include a transceiver **42** located within, or otherwise coupled to the housing **27**, to facilitate both short-range and long-range communications to and from the kiosk **12**. In this regard, the transceiver **42** may include both a short-range circuit and a long-range circuit.

The long-range communications may be to or from a remote server such as diagnostic server **24**, communications server **26**, operations server **28**, which may be accessible via the Internet at a specific web address to facilitate the collection and distribution of data and information to a customer. The short-range communications may be between the kiosk **12** and the handheld communication device **22**. For instance, the short-range communications may be made via Bluetooth®, WiFi, or other short-range communication technologies known in the art. The kiosk **12** may be associate with a kiosk communication characteristic, such as a unique electronic identification number, and the handheld communication device **22** may be associated with a device communication characteristic, such as a unique electronic identification number, which may be used to facilitate such short-range communications, and to ensure communication is between the kiosk **12** and the handheld communication device **22**, and is not with adjacent electronic devices.

The kiosk **12** may additionally include a tool **16** which may be used to retrieve data from a vehicle **14**. In this regard, the tool **16** may be similar to a conventional vehicle scan tool. The tool **16** may include a connector that is plug connectable to the diagnostic port **18** on the vehicle **14**, such as an OBD-II port. The tool **16** may communicate with an onboard vehicle computer, e.g., electronic control unit (ECU) **20**, or other vehicle system, component, sensor, etc., to retrieve data and information therefrom. The tool **16** may also be capable of retrieving vehicle identification information from the vehicle **14**. As shown in FIG. **1**, the tool **16** may be physically connected to the housing via a connector cable **31**, which may be configured to facilitate data and information transfer between the tool **16** and the processor **36** or memory **34** on the kiosk **12**. In an alternative embodiment, the tool **16** may be detachable from the housing **27** and may be capable of communicating with the vehicle **14** when detached or separated from the housing **27**. This may be particularly advantageous in situations where the housing **27** is located inside a store **25** and the vehicle **14** is located in a parking lot outside of the store **25**. In that case, a customer may take the tool **16** from the store **25** and into the parking lot, where the customer's car may be located, to plug the tool **16** into the vehicle **14**. Any data and information collected by the tool **16** may be temporarily stored locally on the tool **16** and then transferred to the memory or processor when the tool **16** is returned to the housing **27**. A holster or cradle may be connected to the housing **27** for connecting the tool **16** to the housing **27**. The holster or cradle may include electrical connections which may engage with corresponding electrical connections on the tool **16** to allow for the transfer of data and information between the tool **16** and the memory **34** and processor **36** when the tool **16** is engaged with the holster or cradle. It is also contemplated that the tool **16** may transfer data and information with the memory **34** and processor **36** via wireless communication. The holster or cradle may be configured to include a locking mechanism to lock the tool **16** in place in connection to the housing **27** during periods of non-use. The locking mechanism may be unlocked in response to the customer placing a credit card into the kiosk, logging into the kiosk system, or otherwise sending an unlock signal associated with an agreement to pay for the diagnostic services.

As noted above, several aspects of the present disclosure relate toward utilizing a handheld communication device **22** during a customer's interaction with the kiosk **12**. The handheld communication device **22** may include a processor **44**, a memory **46**, a transceiver **48**, a camera **50**, a display **52**, and a speaker **54**. In addition, an application may be downloaded onto the smartphone **22**, which may include a diagnostic database **56**, and a communications database **58**, as will be described in more detail below. The application may additionally include instructions for configuring the smartphone **22** to communicate with the kiosk **12** and one or more remote servers **24**, **26**, **28** associated with operation of the kiosk **12**.

Operative Link Between Handheld communication device and Kiosk

Referring now to FIG. **3**, the handheld communication device **22** may be operatively linked to the kiosk **12** by displaying a visual code **60** on the kiosk **12** which may be captured, scanned, or otherwise recognized by the handheld communication device **22**. The visual code **60** may be depicted on the kiosk display **30** in response to the customer activating an initiation button on the kiosk **12** or by the kiosk **12** detecting the presence of the customer in front of the kiosk **12**. The visual code **60** may include a unique QR code, barcode, alphanumeric code, icon, visual pattern, etc., that may be scanned, captured, or otherwise optically identified through the use of the camera **50** incorporated on the handheld communication device **22**.

The visual code **60** depicted on the kiosk display **30** may be configured so as to be readable by a machine (e.g., a smartphone camera), but not readable by a human. In this regard, although a human may view the visual code **60**, mere viewing of the visual code **60** by a human may not allow for derivation of any associated information, such as customer identification, transaction number, diagnostic data, diagnostic summary, etc. Therefore, the use of a non-human readable visual code **60** provides some measure of privacy. Furthermore, privacy associated with the customer's transaction with the kiosk **12** may be enhanced by encrypting some or all communications to and from the kiosk **12**, the sever(s) **24**, **26**, **28**, and the smartphone **22**.

In one embodiment, both the kiosk **12** and the handheld communication device **22** may be linked to operations server **28** which may operate a website accessible by the kiosk **12** and the handheld communication device **22**. The operative link between the kiosk **12** and the operations server **28** allows the operations server **28** to identify which unique code **60** is being displayed on a particular kiosk **12**. In this regard, the operations server **28** may be in communication with a code database having a plurality of preprogrammed codes stored therein and may send a signal including one of the preprogrammed codes to the kiosk **12** in response to a request from the kiosk **12** for a code. Alternatively, the kiosk **12** may include a local code database that may include a plurality of preprogrammed codes stored therein and may retrieve one of the preprogrammed codes in response to activation by the customer.

The scanning or capturing of the unique code **60** by the handheld communication device **22** may cause the handheld communication device **22** to send a signal to the operations server **28** identifying that handheld communication device **22** as having scanned that particular code **60**. The operations server **28** may identify the particular code **60** scanned by the handheld communication device **22** as having been displayed on a particular kiosk **12**. Thus, the operations server **28** is capable of creating an operative link between the handheld communication device **22** and the customer's transaction on the kiosk **12**. Once the operative link is established and identified by the operations server **28**, a unique identification number or other identifier may be assigned by the operations server **28** to the customer or to the specific transaction. Thus, any data, information, solutions, results, etc., associated with the customer's interaction with

the kiosk **12** may be associated with the unique identifier associated with the customer to allow the customer to access such information at any time. For instance, any data or information uploaded to any one of the servers **24**, **26**, **28** may be associated with the unique identifier associated with the visual code **60**, and any data, information or diagnosis generated at any one of the servers **24**, **26**, **28** and associated with the customer's interaction with the kiosk **12** may be associated with the unique identifier. In this regard, the unique identifier may allow the customer, a vehicle professional, or sales associate to later retrieve any data, information, or diagnostic summary stored on the servers **24**, **26**, **28** through the use of the unique identifier associated with the visual code **60**.

Handheld Communication Device as User Interface

The code **60** displayed by the kiosk **12** may also be used to pair the handheld communication device **22** with the kiosk **12** to allow for direct communications between the handheld communication device **22** and the kiosk **12**. In other words, at least some communications between the handheld communication device **22** and the kiosk **12** may not have to pass through an intervening server. Once the handheld communication device **22** is paired with the kiosk **12**, the handheld communication device **22** may be used to retrieve and upload information to the kiosk **12** and can also be used as a display for any data, information or diagnostic results. In this regard, the handheld communication device **22** may mirror any information displayed on the kiosk **12** or supplement anything displayed by the kiosk **12**.

The handheld communication device **22** may be used to gather information that may be needed to determine the specific communication protocol(s) needed to facilitate communication between the kiosk tool **16** and the vehicle **14**. Those communication protocols may be derivable from vehicle identification information, such as the year, make, model, and engine of the vehicle **14**, or the vehicle identification number (VIN) associated with the vehicle **14**. In many vehicles **14**, the vehicle identification information may be easily retrievable using the customer's handheld communication device. For instance, the camera **50** on the smartphone **22** may be used to capture vehicle identification information located on the vehicle **14**. For instance, many vehicles **14** include a barcode or other code or information located in the door jamb of the vehicle **14**.

In-Store Kiosk

In one embodiment, the kiosk **12** may be positioned in a vehicle parts store **25**. A customer inside the store **25** may initiate an interaction with the kiosk **12** by tapping a touch screen or activating another initiation button on the kiosk **12**. Upon initiation, the kiosk **12** may display a QR code **60** on the display screen **30** and the user may scan the QR code **60** with the customer's smartphone **22**. Once the QR code **60** is scanned, the smartphone **22** may automatically open a website associated with the kiosk **12**, either through an app on the smartphone **22**, or initiated in response to scanning the QR code **60**. It is also contemplated that the website may be manually entered by the customer in response to a prompt displayed on the smartphone **22** in response to scanning the QR code **60**. The customer may use the smartphone **22** to enter customer information to the website to correlate the unique QR code **60** to the customer at the operations server **28**. The customer information may include a unique user ID, an electronic ID associated with the smartphone **22** or other customer identifying information. The customer information may additionally include name, address, birthdate, vehicle information, etc.

The customer may retrieve the kiosk tool **16** and take the tool **16** to the customer's vehicle **14** parked in the parking lot or street. In this regard, the kiosk tool **16** may be configured to be remoted from the housing (e.g., the tool **16** may not be attached to the housing via a wire or cable). The customer may connect the tool **16** the diagnostic port **18** on the vehicle **14** and may request an electronic VIN from the vehicle **14**. Upon receiving the electronic VIN, the tool **16** may determine the vehicle-specific protocol for the vehicle **14** under test, and using that vehicle-specific protocol, request diagnostic data from the vehicle **14**. It is contemplated that the user's smartphone **22** may be operatively linked to the tool **16** and used as a communication resource for accessing any additional communication protocols needed from the remote communications server **26** to communicate with the vehicle **14**. For more information regarding the use of the smartphone **22** for linking the tool **16** with remote diagnostic resources, please refer to U.S. Pat. No. 9,384,599 entitled Handheld Vehicle Diagnostic Tool with VIN decoder and Communication System, the contents of which are expressly incorporated herein by reference.

The vehicle **14** may communicate the diagnostic data to the tool **16**, and the received diagnostic data may be temporarily stored on the tool **16**. The customer may return the tool **16** to the kiosk **12** to allow the data to be transferred from the tool **16** to the kiosk **12** using short range communication resources on the tool **16** and kiosk **12**, such as wired communication or wireless communication (e.g. Bluetooth®, WiFi, etc.). The kiosk **12** may upload the retrieved diagnostic data to the remote diagnostic server **24** via the Internet, or other communication pathway(s), using the transceiver on the kiosk **12**. The remote diagnostic server **24** may analyze the diagnostic data and generate a diagnostic report, which may include a summary of the retrieved data (e.g., a translation of the retrieved diagnostic data), a most likely solution, repair services and repair parts associated with the most likely solution. The diagnostic summary may also include a referral for possible repair shops or technicians that can provide the associated repair services and repair parts, along with parts and labor estimates. The diagnostic summary may additionally identify required tools for any repairs, as well as a link to repair videos, and service information, possible recalls, etc. The diagnostic summary may also provide an alert on required parts or repairs, or suggested parts or repairs based on the date of the last inspection/service. In this regard, the vehicle's service history within the network of kiosks **12**, and participating parts stores and repair stores may be accessible for purposes of providing such alerts. For more information regarding the analysis of diagnostic data, please refer to U.S. Pat. No. 8,370,018 entitled Vehicle Diagnostic Process, U.S. Pat. No. 9,824,507 entitled Mobile Device Based Vehicle Diagnostic System, and U.S. Patent Application Publication No. 2016/0027223 entitled Predictive Diagnostic Method and System, the contents of both which are expressly incorporated herein by reference.

The summary may be communicated to the user's smartphone **22**, as well as to the kiosk **12**. The summary may also be stored at the operations server **28** or diagnostic server **24** for subsequent retrieval by the smartphone **22**. In this regard, the summary may be associated with the unique identifier associated with the QR code **60** previously scanned by the customer. Thus, should the customer present the QR code **60**, or any other identifier associated therewith, at a later time, the summary can be retrieved and be downloaded to the smartphone **22**. The diagnostic summary may identify one or more replacement parts and/or one or more repair

services. An associate at the store may be able to retrieve the customer's data, information and summary from the servers **24**, **26**, **28** using the visual code **60**, which may be stored in the memory **46** of the customer's smartphone **22** and depicted on the smartphone display **52** for scanning at the store. Once the code **60** is scanned using a scanner or camera at the store, the computer system at the store or shop may be linked to the servers **24**, **26**, **28** to retrieve the customer's data, information and diagnostic summary. As such, the ability to interface the customer's smartphone **22** with the kiosk **12** may provide for e-commerce opportunities for repair shops and parts stores.

Parking Lot Kiosk

It is also contemplated that the kiosk **12** may be located in a parking lot in close proximity to a parking space intended for a vehicle **14** that is to undergo diagnostic analysis. Once the vehicle **14** is parked, the customer may initiate a transaction on the kiosk **12**. Upon initiation, the kiosk **12** may display the unique visual code **60**, which may be scanned by the camera **50** on the customer's smartphone **22**. The scanning or viewing the unique visual code **60** by the smartphone **22** may cause the smartphone **22** to send a signal including a unique identifier to the operations server **28** such that the customer's transaction with the kiosk **12** may be associated with the unique identifier. The scanning or viewing of the unique visual code **60** by the smartphone **22** may also allow the smartphone **22** to function as an input device to the operations server **28** and/or the kiosk **12**. For instance, vehicle identification information may be entered manually by the user, or the corresponding smartphone app may allow the user to select vehicle identifying characteristics of the vehicle **14**, such as year, make, model, engine of the vehicle **14**. The smartphone **22** may also be used to capture an image of the physical VIN from the vehicle **14**, scan a barcode VIN on the vehicle **14**, or capture an image of the license plate. Such information may be uploaded to the operations server **28** to derive the protocols necessary for communicating with the vehicle **14**. The upload of the vehicle identification information may be done directly from the smartphone **22**, or alternatively, the smartphone **22** may transfer the information to the kiosk **12** via short range communication, and the kiosk **12** may relay the information to the remote operations server **28**. In this regard, the smartphone **22** may be paired with the kiosk **12** via Bluetooth® or other short-range communication protocols to effectuate such information transfer.

After the vehicle identification information has been obtained, the kiosk tool **16** may be plugged into the diagnostic port on the vehicle **14**, and the vehicle data may be obtained. The obtained vehicle data may be uploaded to the diagnostic server **24** for diagnostic analysis. A summary may be prepared by the diagnostic server **24**, which may be communicated to the smartphone and/or the kiosk **12**. Anything displayed on the kiosk **12** may also be displayed on the user's smartphone.

Other Diagnostic Systems

Although the foregoing describes the vehicle diagnostic system **10** as being a kiosk-based system, it is contemplated that other implementations of the system may not be kiosk-based. In this regard, one alternate system may be an electronic tablet-based system, wherein the kiosk is replaced with a tablet computer. In such a system, the tablet computer may display a visual code to create a unique identifier associated with the customer's interaction with the tablet computer, as well as to create an operative link between the tablet computer and the user's handheld communication device **22**.

Furthermore, it is contemplated that the vehicle diagnostic system **10** may be used for automobiles, trucks, drones, electronic vehicles, autonomous vehicles. Furthermore, the diagnostic system **10** may be incorporated into V2I and V2V systems.

For more information regarding the use of a kiosk for vehicle diagnostic purposes, please refer to U.S. Pat. No. 7,734,390 entitled Use of Automotive Diagnostic Console to Diagnose Vehicle, the contents of which are expressly incorporated herein by reference.

This disclosure provides exemplary embodiments of the present invention. The scope of the present invention is not limited by these exemplary embodiments. Numerous variations, whether explicitly provided for by the specification or implied by the specification, such as variations in structure, dimension, type of material and manufacturing process may be implemented by one of skill in the art in view of this disclosure.

What is claimed is:

1. A vehicle diagnostic method comprising:

generating a visual code on a kiosk display for scanning by a camera on a handheld communication device;

facilitating establishment of an operative connection between the kiosk and the handheld communication device in response to scanning of the visual code by the handheld communication device;

receiving, via the handheld communication device, vehicle identifying information retrieved from a vehicle under test;

sending a signal to the kiosk or to a remote server via the handheld communication device, the signal including vehicle diagnostic information and an identifier associated with the visual code;

analyzing the vehicle diagnostic information to determine a possible vehicle fix associated with the vehicle diagnostic information; and

storing the possible vehicle fix on the remote server in a manner which allows for subsequent retrieval of the possible vehicle fix from the remote server in response to receiving the identifier at the remote server.

2. The vehicle diagnostic method recited in claim **1**, further comprising the step of transmitting the possible vehicle fix from the remote server to the handheld communication device.

3. The vehicle diagnostic method recited in claim **1**, further comprising the steps of:

communicating the vehicle identifying information from the handheld communication device to the kiosk; and

deriving at least one vehicle communication protocol from the vehicle identifying information.

4. The vehicle diagnostic method recited in claim **1**, wherein the generating step includes generating a non-human readable visual code on the kiosk display.

5. The vehicle diagnostic method recited in claim **1**, wherein the generating step includes generating a QR code on the kiosk display.

6. The vehicle diagnostic method recited in claim **1**, further comprising the step of encrypting the signal prior to sending the signal to the remote server.

7. The vehicle diagnostic method recited in claim **1**, wherein the vehicle diagnostic information includes sensor data or diagnostic trouble codes.

8. The vehicle diagnostic method recited in claim **1**, wherein the identifier is transaction specific.

9. The vehicle diagnostic method recited in claim 1, further comprising the step of communicating the identifier to the remote server via the handheld communication device.

10. The vehicle diagnostic method recited in claim 1, wherein the step of sending the signal to the remote server includes sending the signal from the kiosk to the remote server via the Internet.

11. The vehicle diagnostic method recited in claim 1, wherein the step of sending the signal to the remote server includes sending the signal from the kiosk to the remote server via the handheld communication device.

12. A vehicle diagnostic system for use with a handheld communication device, the vehicle diagnostic system comprising:

a kiosk having:

a housing;

a transceiver disposed within the housing and configured to communicate with the handheld communication device;

a processor disposed within the housing and capable of generating a signal including an associated visual code;

a display associated with the housing and in communication with the processor to receive the signal, the display being configured to depict the visual code thereon in response to receipt of the signal, the visual code being readable by the handheld communication device and being associated with instructions for configuring the handheld communication device to communicate with the transceiver; and

a diagnostic tool in communication with the housing and communicable with a vehicle to retrieve data therefrom; and

computer executable instructions downloadable onto the handheld communication device for configuring the handheld communication device to:

read the visual code depicted on the display; and

establish communication between the handheld communication device and the kiosk to facilitate data transfer between the handheld communication device and the kiosk; and

display diagnostic information associated with the data retrieved by the diagnostic tool.

13. The vehicle diagnostic system recited in claim 12, wherein the computer executable instructions further configure the handheld communication device to identify a kiosk communication characteristic associated with the visual code in response to receipt of the visual code.

14. The vehicle diagnostic system recited in claim 13, wherein the kiosk communication characteristic is a communication protocol.

15. The vehicle diagnostic system recited in claim 13, wherein the kiosk communication characteristic is a communication address.

16. The vehicle diagnostic system recited in claim 12, wherein the computer executable instructions further configure the handheld communication device to display a prompt to a user to enter vehicle identification information into the handheld communication device.

17. The vehicle diagnostic system recited in claim 12, wherein the computer executable instructions further configure the handheld communication device to utilize an onboard camera to optically obtain vehicle identification information from a vehicle.

18. The vehicle diagnostic system recited in claim 12, wherein the diagnostic information includes diagnostic trouble codes.

19. The vehicle diagnostic system recited in claim 12, wherein the diagnostic information includes a diagnostic solution associated with the retrieved data.

20. The vehicle diagnostic system recited in claim 12, wherein the computer executable instructions further configure the handheld communication device to depict content simultaneously depicted on the display of the kiosk.

21. The vehicle diagnostic system recited in claim 12, wherein the kiosk display is configured to display information associated with the data retrieved by the diagnostic tool.

22. The vehicle diagnostic system recited in claim 12, wherein the handheld communication device display is configured to display information associated with the data retrieved by the diagnostic tool.

23. The vehicle diagnostic system recited in claim 12, wherein the visual code is a QR code.

24. The vehicle diagnostic system recited in claim 12, wherein the diagnostic tool is connected to the housing and is connectable with the vehicle.

25. The vehicle diagnostic system recited in claim 12, wherein the computer executable instructions further configure the handheld communication device to establish communication between the handheld communication device and the kiosk in response to reading the visual code.

26. A vehicle diagnostic system for use with a handheld communication device, the vehicle diagnostic system comprising:

a kiosk having:

a housing;

a transceiver disposed within the housing and configured to communicate with the handheld communication device;

a processor disposed within the housing and capable of generating a signal including an associated visual code;

a display associated with the housing and in communication with the processor to receive the signal, the display being configured to depict the visual code thereon in response to receipt of the signal, the visual code being readable by the handheld communication device and being associated with instructions for configuring the handheld communication device to communicate with the transceiver; and

a diagnostic tool in communication with the housing and communicable with a vehicle to retrieve data therefrom; and

computer executable instructions downloadable onto the handheld communication device for configuring the handheld communication device to:

read the visual code depicted on the display;

establish communication between the handheld communication device and the kiosk to facilitate data transfer between the handheld communication device and the kiosk; and

display a prompt to a user to enter vehicle identification information into the handheld communication device.

27. A vehicle diagnostic system for use with a handheld communication device, the vehicle diagnostic system comprising:

a kiosk having:

a housing;

a transceiver disposed within the housing and configured to communicate with the handheld communication device;

a processor disposed within the housing and capable of generating a signal including an associated visual code;

a display associated with the housing and in communication with the processor to receive the signal, the display being configured to depict the visual code thereon in response to receipt of the signal, the visual code being readable by the handheld communication device and being associated with instructions for configuring the handheld communication device to communicate with the transceiver; and

a diagnostic tool in communication with the housing and communicable with a vehicle to retrieve data therefrom; and

computer executable instructions downloadable onto the handheld communication device for configuring the handheld communication device to:

read the visual code depicted on the display;

establish communication between the handheld communication device and the kiosk to facilitate data transfer between the handheld communication device and the kiosk; and

utilize an onboard camera to optically obtain vehicle identification information from a vehicle.

* * * * *